Short Communications

BIODEGRADABLE DUNKS TO CONTROL CULICINE LARVAE

R K Anish*, Bhaskaran Ravi Latha[1], R Palani Dorai[2]
Department of Veterinary Parasitology, Madras Veterinary College
Tamil Nadu Veterinary and Animal Sciences University, Chennai - 7

Culicine mosquitoes generally prefer stagnant water to lay their eggs. They most commonly infest ponds, marshes, swamps, wetland habitats, a week old water body, stagnant puddles, streams etc. However, they are capable of thriving in a variety of locations and can successfully grow in numbers even when not in their natural habitat. Many species of mosquitoes use containers of water as egg-deposit sites (Tusting et al. 2013)

Mosquito control is a vital public-health practice throughout the world and especially in the tropics because mosquitoes spread many diseases, such as malaria, yellow fever, west nile fever, dengue fever, filariasis (Zaim, 2008).

Utilizing conventional insecticides in targeting anthropogenic mosquito habitats prove to be very expensive in control programs. Moreover, various environmental related concerns arise due to the application of most conventional insecticides (Curtis, 2010). Hence, there is a need for alternative methods, which are effective, environment friendly and less expensive. Use of dunks to release herbal formulations in a sustained manner could be a viable alternate control strategy (Alouani et al. 2009). The current study envisaged the use of commonly available neem (*Azadirachta indica*) and sweet cane (*Acorus calamus*) components in producing a cheap and efficient mosquito dunk, whose benefits could be exploited even by the common man.

Fresh neem leaves were washed, dried and crushed in a motor to form fine powder. Fresh pieces of stem bark of neem tree were also dried, powdered and sieved to separate finer particle from granules and fibres. Roots from sweet cane (*Acorus calamus*) were collected, dried and powdered. Binding agent, gum powder (3g) was added to the neem leaf powder, neem bark powder and acorus powder to prepare neem leaf dunk, neem chip dunk and acorus dunk. Juvenile stages of culicine mosquitoes were collected from a pool of stagnant water using a larval collection net. The culicine larvae were kept in a beaker with a netted enclosure. In vitro trials were conducted to evaluate the efficacy of the dunks at different concentrations (2.5%, 3%, 4% and 5%) on the developmental stages of culicines. The effect of 1% and 1.5% was almost nil, so 2.5% was selected as base line concentration for all trials. Each trial was conducted with 100 mosquito larvae in a beaker with 200 ml distilled water and covered with a netted

[1]Professor and Head, Department of Veterinary Parasitology, Madras Veterinary College, Chennai - 7
[2]Professor, Department of LPT (Dairy Science), Madras Veterinary College, Chennai - 7
*M.V.Sc. Scholar, Corresponding Author

enclosure. The dunk was suspended into the beaker using a permeable cloth (Howard *et al.* 2009).

Effect of *Acorus calamus* dunk on culicine larvae

The effect of dif ferent concentrations of *Acorus calamus* dunk on the juvenile stage of culicines was depicted in table- 1. After 6 hours, acorus dunk at the concentration of 2.5% resulted in 27% larval mortality, while 24%, 22% and 20% larval mortality were noticed with 3%, 4% and 5% acorus dunk respectively. About 95% mortality was observed with 2.5% dunk after 24 hours. No further development was observed in the remaining 5% of larvae upto 24 hours.

Effect of neem leaf dunk on culicine larvae

The effect of different concentrations of neem leaf dunk on the juvenile stage of culicines was depicted in table- 2. After 12 hours, the larval mortality observed was 20%, 16%, 13% and 10% with 2.5%, 3%, 4% and 5% neem leaf dunk respectively. 95% mortality was observed with 2.5% dunk after 72 hours. The remaining 5% of larvae failed to show further development upto 24 hours.

Effect of neem chip dunk on culicine larvae

The effect of different concentrations of neem chip dunk on the juvenile stage of culicines was depicted in table- 3. A larval mortality of 20%, 15%, 12% and 10% was observed with 2.5%, 3%, 4% and 5% neem chip dunk respectively, 12 hours post exposure. After 72 hours, 95% mortality was observed with 2.5% dunk. The remaining 5% of larvae failed to develop into the next stage.

Comparative analysis of the culicine dunks

Larval mortality of 95% could be obtained with 2.5% of *Acorus calamus* dunk within 24 hours and a similar level of mortality was obtained with 2.5% neem leaf dunk and 2.5% neem chipping dunk only after 72 hours.

The active ingredient of acorus is beta-asarone while that of neem is azadirachtin (Chavan, 2005). They are one of the widely used insect growth regulators. Because of its structural resemblance to the natural insect molting hormone ecdysone, azadirachtin and beta-asarone interrupts molting, metamorphosis, and development of the female reproductive systems (Sharook et al. 2010). Immature mosquitoes exposed to azadirachtin and beta-asarone (mainly by ingestion) may molt prematurely or die before they can complete a properly timed molt . Those that survive the acorus and neem dunk treatment are likely to develop into deformed adult incapable of feeding, dispersing, or reproducing (Kalyanasundaram and Dos, 2011). It was concluded that further investigation would explore their use as agents for culicine larval control.

REFERENCES

Alouani., A., Rehimi, N. and Soltani, N. (2009). Larvicidal activity of a neem tree extract (azadirachtin) against mosquito larvae. *J. Biol. Sci.* 2(1)**:** 15–22.

Chavan, F.R. (2005). Chemistry of alkanes separated from leaves of Azadirachta indica and their larvicidal/ insecticidal activity against mosquitoes. In: Proceedings of 2nd International Neem Conference, Rauischholzhausen, Pp 59-66.

Curtis, C.F. (2010). Should DDT continue to be recommended for malaria vector control?. *Med. Vet. Entomol.* 8: 107–112.

Howard., A.F.V., Adongo, E.A. Hassanali, A. Omlin, F.X. Wanjoya, A. Zhou, G. (2009). Laboratory evaluation of the aqueous extract of *Azadirachta indica* (neem) wood chippings on *Anopheles gambiae* s.s. (Diptera: Culicidae) mosquitoes. *J Med Entomol.* 46: 107–14.

Kalyanasundaram, M. and Dos, P.K. (2011). Larvicidal and synergistic activity of plant extracts for mosquito control. *Ind. J. Med. Res.* 82: 1–19.

Sharook., Z., Balan, K. Jiang, Y. and Rembold, H. (2010). Insect growth inhibitors from two tropical meliaceae. Effect of crude seed extracts on mosquito larvae. *J. Appl. Ent.* 111: 425–430.

Tusting., T., Thwing, J. Sindair, D. and Fillinger, U. (2013). Mosquito larval source management for controlling malaria. *Coch. Data. System. Rev.* 8: 192-194.

Zaim, M. (2008). Malaria control, present and future. Journal of the American Mosquito Control Association, 3: 392– 6.

Table 1. Effect of *Acorus calamus* dunk on culicine larvae

Concentration of the dunk	Per cent larval mortality			
	6 hours post exposure	12 hours post exposure	18 hours post exposure	24 hours post exposure
2.5% *Acorus calamus* dunk	27	55	75	95
3% *Acorus calamus* dunk	24	40	63	85
4% *Acorus calamus* dunk	22	38	60	85
5% *Acorus calamus* dunk	20	38	58	83
Control 1 & 2	-	-	-	-

Control 1 (3g binder in 200ml water) = No mortality.
Control 2 (200 ml water) = No mortality.

Table 2. Effect of neem leaf dunk on culicine larvae

Conc. of the dunk	Per cent larval mortality					
	12 hours post exposure	24 hours post exposure	36 hours post exposure	48 hours post exposure	60 hours post exposure	72 hours post exposure
2.5% neem leaf dunk	20	38	55	73	79	95
3% neem leaf dunk	16	30	46	62	77	82
4% neem leaf dunk	13	26	43	59	77	80
5% neem leaf dunk	10	22	41	57	76	80
Control 1& 2	-	-	-	-	-	-

Table 3. Effect of neem chip dunk on culicine larvae

Conc. of the dunk	Per cent larval mortality					
	12 hours post exposure	**24 hours post exposure**	**36 hours post exposure**	**48 hours post exposure**	**60 hours post exposure**	**72 hours post exposure**
2.5% neem chip dunk	20	40	56	73	79	95
3% neem chip dunk	15	30	48	63	78	84
4% neem chip dunk	12	25	43	58	76	82
5% neem chip dunk	10	22	41	57	74	80
Control 1 & 2	-	-	-	-	-	-